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GAS ABSTRACTS

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1. GAS INDUSTRY

Competitive Fuel Comparison

Lyon, W. H. and Colby, D. S. PRODUCTION, CONSUMPTION, AND USE OF FUELS AND ELECTRIC ENERGY IN THE UNITED STATES IN 1929, 1939 AND 1947. U.S. Bureau of Mines Report of Investigations 4805 (1951) October.

The production and use of each of the fuels and electric energy in the United States for the census years 1929, 1939 and 1947 is presented in the usual units of measurement and also on a uniform Btu basis. Nine large detailed tables show the fuels subdivided into 6 primary and 36 secondary types; the production, imports, exports, self-consumption, and net available fuel is given for each. The consumption by 12 energy producing industries, by 9 grouped manufacturing industries, by 7 transportation industries, and for domestic (and commercial), defense, non-fuel and miscellaneous uses is given for all fuel types insofar as the census data is available. Definitions, conversion factors and a detailed bibliography of source data are given. The report is a valuable reference for comparing energy production, fuel efficiencies, and fuel requirements of the country.

O. P. Brysch

McCloud, L. W. COMPARATIVE COSTS OF COMPETITIVE FUELS: A STUDY OF FUEL CONSUMPTION BY MANUFACTURING INDUSTRIES IN THE UNITED STATES. Dept. of Economics and Bus. Administr., West Virginia University, Morgantown. Bulletin Series 51, No. 12-4 (1951) June.

This bulletin is a statistical study of fuel consumption and of the comparative costs of major fuels in manufacturing industries. It is a further refinement of the data in MC 203, "Fuels and Electric Energy Consumed" of the 1947 Census of Manufactures. Eight fuels,—bituminous coal, anthracite coal, coke, fuel oil, natural gas, manufactured gas, mixed gas and electric energy,—are compared as to total consumption in terms of physical units and of heat units, and are also compared as to percentage of total fuel cost and proportion of total energy supplied by each fuel. Five tables show the comparisons by geographical areas, by states and by certain metropolitan subdivisions for various industry groups as of 1947.

O. P. Brysch

Riley, D. H. HOW COAL, OIL AND GAS COMPARE. *Power* 95, 90-93 (1951) November.

This article compares the operation of the Oak Ridge Power plant using coal, oil, gas, and mixtures of all three. Operating procedures and difficulties on each type of fuel and conversion problem are discussed. Graphs depicting relation of flue-gas data to different fuels, tables showing comparison of coals used, and differences in cost and boiler performance of the three fuels are presented.

R. A. Brown

Fire Extinguishing Agents

Downing, R. C., Eiseman, B. J., Jr. and Malcolm, J. E. HALOGENATED EXTINGUISHING AGENTS. PARTS I AND II. *Natl. Fire Prot. Assoc. Quarterly. Part I.* 45, 110-131 (1951) October.

Part I contains a brief discussion of toxicity, stability, and effectiveness of various fire extinguishing agents. The results of the comparative effectiveness and stability of selected halogenated fire extinguishing agents tested are shown. Part II describes the purpose of the research, which was to find an agent suitable for use on both Class "B" and "C" fires. Results of a series of laboratory studies are discussed. Also included are the results of the field tests which were run to verify the laboratory findings.

B. G. Lang

Gas Prices

Rather, C. P. THE PUBLIC CAN AND WILL PAY HIGHER PRICES FOR GAS. *Gas Age* 108, 19, 21, 52-56 (1951) October 25.

The author, who is Assistant Deputy Administrator of Petroleum Administration for Defense, gives his views on the gas limitation order which was finally issued last August after the Bow amendment. It is an answer, or set of answers, to the critics. The point is made

that natural gas should sell at a higher price, closer to its real value, so as to decrease the tremendous demand. It is claimed that the public can, should, and will pay a higher price as the cost of exploring and transmission is constantly increasing.

J. D. Parent

Industry Regulation

Farrell, C. THE SAFETY REGULATION OF HIGH-PRESSURE PIPELINES. *Public Utilities Fort.* 48, 569-574 (1951) October 25.

The author considers national regulation of high-pressure pipelines to be detrimental rather than advantageous, in view of its cumbersome, restrictive nature. Local regulation, being more cognizant of and adaptable to the particular needs of a locality, would be more desirable than national regulation. In view of the improved techniques of installation, production, and maintenance, employed by the individual gas companies, the author suggests that a publicity campaign would inform the public of the industry's constant self-improvement, and its consequent capability of self-regulation.

J. J. Guyer

Load and Profits

Barnes, C. C. HOW BALTIMORE BUILT LOAD AND PROFITS AFTER NATURAL GAS ARRIVED. *Gas Age* 108, 30-34 (1951) October 25.

An analysis of the Baltimore gas load since conversion to natural gas in 1950 is given. By expanding service they were able to reduce rates and still make a comfortable profit. The main concentration was on firm industrial loads, house heating and better appliance sales.

W. G. Bair

Phillips Review

PHILLIPS REVIEW ASKED. *Oil Gas J.* 50, 69 (1951) November 29.

A court review of the FPC order holding Phillips not subject to regulation under the Natural Gas Act has been requested by the cities of Detroit, Kansas City and Milwaukee, as well as by the Wisconsin Public Service Commission.

J. D. Parent

State Gas Tax

GAS-TAX BATTLE ON. PIPE-LINE FIRMS ACT WITH PROTEST PAYMENTS TO TEXAS. *Oil Gas J.* 50, 37 (1951) November 1.

Some companies have paid the new natural gas tax in Texas under protest, paving the way for a check into the constitutionality of the law. Texas expects to collect $14 million annually from the tax.

J. D. Parent

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Farrar, L. D. UNDERGROUND GAS STORAGE UP TO DATE. p. 10

Plummer, H. C. MANY PIPELINES PROPOSED FOR CANADA. p. 10

Sheils, B. CANADIAN PIPELINE EXPANSION ASSURES RAPID GROWTH OF PRAIRIE PROVINCES OIL INDUSTRY. p. 10

2. APPLIANCES

Appliance Servicing

Springborn, H. W. CUSTOMER SERVICE RESPONSIBILITY IS SPELLED OUT IN NEW YORK CITY. *Gas Age* 108, 56, 60, 148-150 (1951) October 11.

It is the responsibility of the owner to keep appliances in safe operating condition; and the user's responsibility to keep them clean. The gas utilities responsibility normally ends at the meter, although they may be held responsible if fluctuating pressure creates the hazard or if they had knowledge of a dangerous condition and did not stop service to the appliance. There are reproductions of public announcements made by Servel, Consolidated Edison, and the Department of Health.

B. G. Lang

Incinerators

Dierkes, J. G. THE INSTALLATION AND VENTING OF GAS-FIRED INCINERATORS. *Gas Heat in Industry* 2, 34-35 (1951) December.

The principles of installation and venting of automatic gas-fired incinerators are reviewed with notations on existing practice. These in-

clude chimney height, chimney entrance, cleanouts, dual flues, uncleaned chimney and material.

D. L. Nicol

3. COMBUSTION AND INDUSTRIAL FURNACES

Coal Transportation

MOVING COAL TO MARKET. *Coal Age* **56**, 70-75 (1951) November.

Costs of older methods of transporting coal to market, by rail, water, and truck, are compared with those of the projected methods of pipeline, cross-country belt, or pipeline gas. A comparative table of cents/ton-mile coal equivalent and mills/MMBtu/mile is given, which also includes costs of transporting such forms of energy as oil, natural gas and electricity. Each method is discussed in some detail. The pipeline gas transportation of the energy of coal awaits the development of a high-volume, high-Btu, low conversion-cost process. [See also *Gas Abs.* **7**, 178 (1951) September].

O. P. Brysch

Enamelling Oven

THE PRINCIPLES OF STOVE ENAMELLING. CONVECTION AND RADIANT OVENS. PART II. *Ind. Finishing* **4**, 266, 268, 270, 272-281 (1951) November.

The principle components of a direct gas-fired, camel-back, bar-type conveyor oven incorporating hand dipping equipment are outlined for drying enamel.

D. L. Nicol

Industrial Heating

Rehfeldt, H. F. GAS BURNERS AND COMBUSTION SYSTEMS. PART I. *Ind. Heating* **18**, 1976-1984, 2132 (1951) November.

Various types of industrial burners and combustion systems are discussed. Atmospheric, two pipe and one pipe systems are the combustion processes described.

B. G. Lang

Power Plant Fuels

Betz, P. L. and Karrer, S. (assigned to Consolidated Gas Electric Light & Power Co. of Baltimore) COAL HANDLING SYSTEM. U.S. 2,573,535 (1951) October 30.

The handling of coal to boiler plant pulverizers is simplified by eliminating the usual large coal ducts and substituting instead a multiplicity of bin feeders delivering coal to small-diameter coal lines usually disposed perpendicularly to the pulverizer feed hopper.

C. von Fredersdorff

Kreisinger, H. (assigned to Combustion Engineering-Superheater, Inc.) METHOD FOR BURNING PULVERIZED COAL. U.S. 2,573,-910 (1951) November 6.

The patent relates to a method of burning pulverized coal which consists of passing a high-velocity rotating annular mixture of coal and air through a vertically disposed cyclone furnace. Continuity of rotation and turbulent mixing of the suspended fuel bed is maintained by a series of inwardly tangential air nozzles disposed along the periphery of the furnace.

C. von Fredersdorff

Reiter, F. M. HOW TO BUY COAL AND EVALUATE ITS QUALITY. *Power Eng.* **55**, 56-60, 112-113 (1951) November.

This article describes a system for the purchase of coal by utility power plants, which is based upon the cost per million Btu as determined by careful laboratory control of all shipments. A description of cost records and periodical ratings for comparing different coals is given.

O. P. Brysch

B-F GAS TO FUEL 60,000 KW AT NEW FAIRLESS STEEL WORKS. *Power Eng.* **55**, 95, 113-114 (1951) October.

A description of the major equipment and the auxiliary equipment of the new power plant, including rated performance data, is given.

J. J. Guyer

Smelting Furnaces

Brandt, D. J. O. LOW-SHAFT IRON SMELTING FURNACES. *Coke & Gas* (British) **13**, 351-356, 364 (1951) October.

The deterioration in supplies of high quality iron ore and coking coal, which has increased the difficulties and costs of operating high-shaft

blast furnaces, has drawn some attention to the possibilities of low-shaft smelting. Experiences are described with smelting in three types of low-shaft furnaces: (1) the electric furnace (Tysland-Hole); (2) the oxygen-enriched blast furnace (Oberhausen and Liège); and (3) the briquetted charge furnace (Humboldt).

O. P. Brysch

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Dixon-Lewis, G. A METHOD FOR THE MEASUREMENT OF THE TEMPERATURE DISTRIBUTION IN A BUNSEN FLAME. p. 14

Pickering, H. S. BURNING VELOCITY DETERMINATIONS. p. 14

Schuller, P. APPARATUS FOR DETECTING THE CALORIC OUTPUTS OF GASEOUS FUELS. p. 19

Zabetakis, M. G. THE FLAMMABILITY CHARACTERISTICS OF THE AROMATIC SERIES. p. 14

4. CARBONIZATION AND GASIFICATION

Coal Oxidation Products

Knops, J. J. (assigned to De Directie van de Staatsmijnen, Netherlands) MANUFACTURE OF PYROMELLITIC ACID. U.S. 2,576,020 (1951) November 20.

The benzene polycarboxylic acids forming the crude oxidation products of coal are coated upon fine solid particles (pumice, coke, silica), are fluidized with steam at 250°-400° C., and pyromellitic acids are recovered from the steam condensate in improved yield and purity.

O. P. Brysch

Miller, R. J. (assigned to California Research Corporation) PRODUCTION OF POLYCARBOXYLIC ACID PRODUCTS. U.S. 2,576,625 (1951) November 27.

Pyromellitic acid compounds are produced by air oxidation of durene or its homologous tetraalkyl benzenes in vapor form, by means of a supported vanadium pentoxide catalyst at 850 to 1050° F.

O. P. Brysch

Gas Cleaning

Blomen, T. (assigned to Aktiebolaget Linderoths Patenter, Stockholm, Sweden) APPARATUS FOR SEPARATING SOLID PARTICLES FROM GASES. U.S. 2,571,331 (1951) October 16.

This invention relates to an apparatus for separating solid particles from a gaseous stream by imparting to the gas a spiral movement and passing it through a perforated filter cone.

E. J. Pyrcioch

Hydrocarbon Cracking

Hartwig, K. T. and Haufe, T. B. (assigned to Universal Oil Products Co., Chicago) AUTOTHERMIC CRACKING REACTOR. U.S. 2,572,338 (1951) October 23.

An apparatus is described for the autothermic cracking of a hydrocarbon stream, such as ethane, propane, or butane, in the presence of an oxidizing stream of air or oxygen. Essential features of the reactor include an igniter, a cone-shaped, perforated hydrocarbon inlet which causes hydrocarbons to be mixed with a parallel air stream in a confined annulus, and a refractory-packed chamber. The effluent gas may be used as a supplement gas for peak load purposes.

C. H. Riesz

Mechanical Producers

Gonzenbach, F. von (assigned to Vogogas Ltd., Switzerland) DRY ASH REMOVAL FOR GAS PRODUCER. U.S. 2,572,543 (1951) October 23.

This is a patent for a dry ash removal apparatus for gas producers having rotating grates.

E. J. Pyrcioch

Modern Carbonization

ESSEX BULK SUPPLY SCHEME. *Gas World* (British) 134, 400-403, (1951) November 3; *Gas J.* (British) 268, 101-111 (1951) October 10; 276-278 (1951) October 31; *Gas Times* (British) 69, 232-34, 239 (1951) November 16.

One bench of 16 Woodall-Duckham continuous vertical retorts, with coal and coke handling,

and gas producers, of the two under construction at Chelmsford, Essex, is now in operation. The completed plant will carbonize 256 tons coal/day, and yield 4 MMcf gas for the new Ipswich grid of the Eastern Gas Board.

O. P. Brysch

MARGAM COKE OVENS AND BY-PRODUCT PLANT. *Gas World* (British) **134**, *Coking Section*, 105-107 (1951) November 3.

The new coke-oven plant of the Steel Co. of Wales at Margam, Wales, started earlier this year, consists of 90 Simon Carves compound superjet ovens, which carbonize 2500 tons/day of dry coal. A complete new Baum type washery and blending plant built by Coppee Co., Ltd., supplies washed coal. By-product equipment consisting of 6 indirect primary condensers, 2 exhausters, 5 precipitators, 2 saturators, (unlined monel), 2 secondary coolers and 4 benzole scrubbers, handles up to 1.375 MMcf gas/hour, to be sent later to the South Wales gas grid. The new coke preparation plant is briefly described.

O. P. Brysch

£ 8,000,000 COKE OVEN PLANT. LONDON CEREMONY GIVES MAIN CONTRACTORS THE "GO-AHEAD" SIGNAL. *Gas World* (British) **134**, 334 (1951) October 13; **134**, (*Coking Section*) **105**, (1951) October 6; *Coke and Gas* (British) **13**, 64 (1951) October.

The National Coal Board has authorized the Woodall-Duckham Co. to begin design and purchasing for the erection of the largest NCB-owned coke plant at Wingerworth, near Chesterfield. The project includes 106 coke ovens, coal blending, by-product recovery, benzol and tar refinery, gas purification and sulfuric acid plant. From 750,000 tons coal, the annual production of 500,000 tons coke, 24 MMcf/day of surplus gas, 3 million gal crude benzole, 6 million gal crude tar, and 50 tons/day sulfuric acid is planned. The work forms part of the program of new construction and replacement of small obsolete plants by efficient centralized plants in each of the major coke-producing divisions.

O. P. Brysch

Oil Gas

Bell, J. F. PORTLAND'S EXPERIMENTS WITH HIGH-BTU OIL GAS. *Gas* **27**, 52-56 (1951) November.

This article discusses the conversion from low-Btu oil gas to high-Btu oil gas production practise when using a 20-foot outside diameter twin-shell generator and Bunker "C" fuel and premium oil available in the Pacific Northwest. A comparison of twin generator, Hall regenerative and Portland twin generator operations is made and the net FOTS costs are tabulated for various high-Btu oil gas processes. Detailed results for the May, 1951 Portland high-Btu oil gas tests are presented.

H. R. Linden

Charlton, H. E. (assigned to Petrocarbon Limited, London) U.S. 2,574,088 (1951) November 6.

A two-stage furnace for converting straight run naphthas or kerosene into gaseous olefins and liquid aromatics at 700 to 900° C. is described.

H. R. Linden

Linden, H. R. THERMAL CRACKING. EFFECTS OF PROCESS VARIABLES AND FEEDSTOCK PROPERTIES ON THE YIELDS AND COMPOSITIONS OF THE PRODUCTS. *Petroleum Processing* **6**, 1389-95 (1951) December.

Data and correlations obtained from laboratory cracking tests of petroleum oils at absolute pressures from one to four atmospheres and indicated temperatures from 1400 to 1700° F. are presented. The oils used ranged from Bunker C fuels to natural gasolines. Residence times from one to fourteen seconds in cracking atmospheres containing varying concentrations of hydrogen, methane, ethylene and inerts were employed. The existence of a relationship between the partial pressures of the paraffins, unsaturates and hydrogen in the product gas, comparable to the methane-ethylene-hydrogen equilibrium was demonstrated under these temperature, pressure and residence time conditions. In inert atmospheres or in the absence of diluents it was possible to define a partial pressure product-constant as a function of temper ature for this system. When cracking in hydrogen-containing atmospheres, the rate of ap-

proach to the partial pressure product-constant was shown to be a function of the hydrogen to oil feed-ratio and the cracking temperature. Empirical equations for estimating gaseous product distribution in inert or hydrogen-containing atmospheres as a function of the carbon-hydrogen ratio of the feed hydrocarbon, residence time, partial pressure of oil gas, cracking temperature and hydrogen to oil feed-ratio are presented.

Author's Abstract

Utterback, E., and Fahnestock, F. C. (assigned to Socony-Vacuum Oil Co.) METHOD AND APPARATUS FOR HYDROCARBON CONVERSION. U.S. 2,574,850 (1951) November 13.

This is another in a large number of continuous, moving-bed cracking units employing continuous solids feed and removal by conveyors, and regeneration in a separate vessel.

H. R. Linden

Oxide Purifiers

Clephane, P. F. AVAILABLE IRON IN PART-SPENT OXIDE. *Gas J.* (British) **268**, 421, 427-429 (1951) November 14.

Dehydration of iron oxide was shown to be the main cause of loss of available iron. To prevent this from occurring in part-spent oxide, the material should not be stored in heaps over 2 feet deep until it has been disintegrated and its water content adjusted to between 15 and 25%. Oil scrubbing, to remove condensables from the gas, and air and steam additions to the second taker have shown some promise in reducing dehydration of the oxide by the gas stream.

C. E. Hummel

TRAY PURIFIERS—A NEW TYPE OF OXIDE PURIFICATION PLANT. *Gas J.* (British) **268**, 420 (1951) November 14.

This new installation consists of purifier boxes which contain a number of trays of the oxide material. The trays are handled and filled mechanically. More even temperature of the purification material, greater capacity, reduced corrosion and lower manpower requirements are some of the improvements over usual dry-box purification.

C. E. Hummel

Pitch Carbonization

Davies, C., Jr. (assigned to Pittsburgh Consolidation Coal Company) CARBONIZATION APPARATUS. U.S. 2,575,587 (1951) November 20.

Pitch is carbonized by injecting (after melting) into a moving body of finely divided coked material which is maintained at coking temperatures in a rotary cylindrical retort. Coke may be discharged continuously or intermittently, and a portion of it may be crushed and returned to the retort as a base material.

O. P. Brysch

Sulfur in Ammonia Fixation

GYPSUM, NOT SULFUR. *Chem. Week*, **69**, 33, 34 (1951) Oct. 13.

A new plant for manufacture of 1000 T/day of ammonium sulfate without using sulfuric acid is being started at Sindri, India. Calcium sulfate (finely ground) from Southern India, is reacted with ammonium carbonate solution. Ammonia synthesized locally from coal, and carbon dioxide, produced as a co-product, are readily combined in solution and reacted with the sulfate. Precipitated calcium carbonate is filtered out and the solution heated in a salting type evaporator to remove $(NH_4)_2\,CO_3$ and to crystallize $(NH_4)_2SO_4$. This process was commercially operated in Oppau and Leuna, Germany, since World War I, and later in Billingham and Prudhoe, England.

O. P. Brysch

Tar Research

Green, S. J. and Olden, M. J. THE INSOLUBLE MATTER OF COAL TAR. VII. DILUTION OF TARS. *J. Applied Chem.* (British) **1**, 433-443, (1951) October.

Previous application of surface-tension rules to dilution of coal tars is criticized and it is considered that the surface tension of the mixture of diluent with the oils of the tar must be considered rather than the surface tension of the diluent alone. Maximum insolubles in a tar-diluent system occur at lower ratios of diluent to tar for both horizontal- and vertical-retort tars. The relation of maximum insolubles to the surface tension of the diluents has been exam-

ined and generally it is shown that diluents with surface tensions above that of the tar behave quite differently from those of lower surface tension. The results are interpreted to mean that flocculation and precipitation followed by solution or redispersion occur when a diluent of surface tension lower than the tar is added in increasing amounts.

Authors' Abstract

Underground Gasification

Elder, J. L., Fies, M. H., Graham, H. G., Montgomery, R. C., Schmidt, L. D., and Wilkins, E. T. THE SECOND UNDERGROUND GASIFICATION EXPERIMENT AT GORGAS, ALABAMA. U.S. Bureau of Mines Report of Investigations 4808 (1951) October.

The second Gorgas experiment, of 22½ months duration, in the 42-inch Pratt bed coal was conducted without difficulty at air-blast rates up to 7500 cfm. Horizontal mined entries (double) 1100 ft long and 10 ft wide, and a single entry 300 ft long were used, with 7 vertical boreholes for blasts and offtakes. Gas of 72 to 90 Btu. was obtained in quantities of 6.7 to 9.4 MMcf/day, from two perimeter boreholes, and 10,485 tons of coal or 1.92 acres (daf) were gasified, but not continuously because of inadequate control of air-coal contact. Experiments were made in forcing fluid contact with the coal faces, but the roof action (bloating) has not yet been assessed. High rates of fluid flow and of coal consumption were desirable. Utilization of the heat energy output in gas turbines or in steam generation was possible. A new installation for gasification of the deeper American bed is under construction.

O. P. Brysch

Water Gas

Donnelly, R. P., Taylor, F. J., and Broadbent, R. CARBURETTED WATER GAS MANUFACTURE FROM WEST AUSTRALIAN SUB-BITUMINOUS COAL. *Natl. Gas Bull.* (Australia) 15, 10-17 (1951) July-August.

A Power Gas Corp. carburetted water gas plant rated at 500,000 cu ft/day and having a generator of 3.5 ft diameter has successfully operated on a West Australian sub-bituminous coal for the past two years. The operating cycle consisted of the conventional air blast, steam uprun and steam backrun, producing a 500-530 Btu gas using 2-2.3 gal gas oil/Mcf and 40 lb coal/Mcf. The coal as charged analyzed 20% water, 22.0% volatile matter, 51.0% fixed carbon, 7.0% ash, 82.5% ultimate carbon, 3.85% ultimate hydrogen, and had a heating value of 9500 Btu. Operation with coal decreased the set capacity approximately 10% as compared to coke firing. Since the plant had no waste heat boiler, all blow gases were burned in the carburettor, thereby placing a limit on the maximum air/steam ratio for the cycle to prevent overheating of the carburettor. A summary of test data and costs is given.

C. von Fredersdorff

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Murdock, H. R. INDUSTRIAL WASTES. OZONE PROVIDES MEANS FOR OXIDIZING PHENOLIC COMPOUNDS. p. 11

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Black Manufacture

Glaxner, D. (assigned to Columbian Carbon Co., New York) FLAME SHIELD ASSEMBLY FOR CARBON BLACK APPPARATUS. U.S. 2,571,127 (1951) October 16.

In the manufacture of carbon black by the channel process, a flame shield to protect flames from side-drafts is disclosed. A shield unit is comprised of four sheet-metal plates, (20 gage), extending parallel to two gas (burner) pipes. These are positioned against warping and supported by two transverse metal plates, notched to rest securely on the gas pipes.

O. P. Brysch

BLACK PROBLEM. *Chem. Week* 69, 13 (1951) November 24.

With the price of natural gas on the ascent and the trend toward use of finer, high-structure blacks from highly aromatic liquid hydrocarbons, a shift in the relative amount of oil black

is expected. In 1950, about one quarter of the carbon black produced was made from oil, but by the end of 1952, the fraction may be one-half. If the price of blacks rises too high, there may be stiff competition from inorganics such as silica. J. D. Parent

Gas Conditioning

AMERICAN GAS FUNDAMENTALS — TRANSMISSION — GAS CONDITIONING. *Am. Gas J.* 175, 31-34 (1951) November.

A short summary is given on methods of gas conditioning including water removal, removal of various sulfur compounds, selective recovery of hydrocarbons and dust removal.

H. R. Linden

Gasoline Recovery

Reeves, W. B. DEVELOPMENT IN HUGOTON GAS FIELD. *Oil Gas J.* 50, 132, 133, 156, 157, (1951) November 15.

A brief description with flow diagram is given of the natural gasoline plant of the Hugoton Plant Gas & Oil Co. The plant has a capacity of 120 MMcf per day. A unique feature of the plant includes operation without steam. Circulating lean oil is used as the heating medium with one gas-fired lean oil Petro-Chem heater providing the heat. The rich oil processing stream includes a deethanizer in which butane is pumped into the bottom to provide sufficient vaporization for stripping the ethane.

O. T. Bloomer

Holder Purging

Hanson, T. A. "INERT" PURGING OF A WATERLESS GAS HOLDER. *Gas World* (British) 134, *Coking Section*, 8-9 (1951) November 3.

An account of the purging of a 750,000 cu ft gas holder by a procedure which removes the risk of explosion is presented. A review of present day practices and theories of inert purging and a description and running requirements of the Harrison purging machine follows. The actual operation of the preliminary arrangements, the initial purge of gas to air and the final purge of air to inerts is outlined. The explosive limits of the gas in question are presented graphically.

R. A. Brown

King, G. R. and Yeaw, J. S. STEAM PURGING AN LPG TANK. *Am. Gas Assoc. Monthly* 33, 25-27 (1951) October.

Tests made to provide data for steam purging an LPG tank out of service are described and discussed. The results indicate that mixing of the air and steam was as complete when the steam was introduced and vented at the same end of the tank as it was when the steam was introduced at one end and vented at the opposite end. Temperature effects, such as the expansion of the tank and the softening of the tar-impregnated padding, were noted. Condensation of the input steam in the tank was 90-95%.

J. J. Guyer

Pipeline Heat Losses

Simon, J. T. HEAT LOSSES FROM BURIED GAS GATHERING LINES. *World Oil* 133, 171, 172 (1951) November.

Experimental temperature data on the gathering system at Church Buttes soil for 4½ in. OD and 8⅝ in. OD lines are presented. The total length of the line is 18000 ft. The heat loss coefficient for each line has been calculated. An equation to determine the gas temperature leaving the line is given.

D. C. Gami

Pressure Regulation

Brooks, D. M. GAS PRESSURE REGULATOR. U.S. 2,573,180 (1951) October 30.

This is a low-pressure regulator in which the controlling diaphragm is also the valve. It seats on a circular valve seat radially outside of and adjacent to its peripheral margin. Pressure in excess of downstream setting collapses the diaphragm tending to expand it into contact with the said seat. Advantages are said to be the fact that no venting of the valve is required, the freedom from friction of metal guides, and near freedom from gravity inertia.

B. G. Lang

MacLean, A. D. SELECTING A REGULATOR. *Gas* 27, 45-52 (1951) November.

Pressure regulators are classified by types, and a picture of each type is included. The operation and characteristics of these types are discussed separately. In conclusion, there is a

comparison of the types, together with a table to use as a guide for selection of the correct regulator for the job.

B. G. Lang

Partridge, F. M. THE NOISE PROBLEM AT REGULATOR STATIONS. *Instruments* **24**, 1361-1364 (1951) November.

The problem of noise reduction at gas regulator stations is discussed. Experimental data is presented which shows the noise produced by different regulators and the noise reduction effected by various methods.

B. E. Hunt

Production Problems

Horner, V. V. APPRAISAL OF DRILLING MUD COSTS. PART I. *World Oil* **133**, 127-144, (1951) December.

This is the first of a series of two discussions dealing with the cost of drilling mud. Some cost data are given. Maintenance is included in the discussion.

J. D. Parent

Nathan, C. C. CORROSION INHIBITION IN GAS CONDENSATE WELLS BY INTERMITTENT INJECTION OF ALKALINE SOLUTIONS. *Corrosion* **7**, 397-399 (1951) November.

Previous work on corrosion in gas condensate wells indicate the cause to be due to high acidity in the small amount of water found in these wells. Use of as little as 2.5 lb of sal soda or sodium carbonate decahydrate in 30 gal of water per day for every MMcf of gas produced is adequate for corrosion inhibition, since investigations find that actually very little of the alkali is used up in acid neutralization. Other factors that must be considered are the MMcf gas produced, intermittent or continuous injection of the alkali solution, and the condition of the annuli outside of the tube well.

S. Mori

Richardson, J. C., Jr. GAS WELL CASING LEAK DETECTOR. *World Oil* **133**, 176 (1951) December.

A new casing leak detector is described. A fabric covered device is lowered on a wire measured line, and the fabric attaches itself to the casing at the point of leakage when this level is reached.

J. D. Parent

Ritch, H. B. and Cardwell, P. H. NEW TECHNIQUES FOR APPLICATION OF PLASTICS IN CONSOLIDATING FORMATIONS. *World Oil* **133**, 177-184 (1951) December.

Latest techniques for performing sand consolidation treatments are described, and results on 37 actual cases are presented. The authors discuss a new method of consolidating sands wherein the formation is first treated with an acid to dissolve clays which may plug up the pore spaces. The value of this acid treatment is shown in tabular form where different formations in Louisiana, Arkansas, Mississippi and Texas have been treated.

Authors' Abstract

Sulfur Recovery

Foster, A. L. FROM OIL AND GAS COME 400,000 TONS SULFUR A YEAR. *Petroleum Engr.* **23**, C3-C4 (1951) November.

Factors causing the present sulfur shortage, and efforts being made to overcome this situation are discussed. Sulfur recovery processes are described. Nineteen oil and gas industry sulfur-recovery units are listed with their dates of completion and daily capacity.

C. E. Hummel

Stormont, D. H. SHAMROCK RECOVERS 30 TONS OF SULFUR DAILY AT MCKEE PLANT. *Oil Gas J.* **50**, 63, 74 (1951) November 1.

Acid gases from a Girbotol gas-treating unit are processed in this completely automatic sulfur recovery plant. A photograph and a flow diagram accompany the detailed description of this plant, designed and constructed by the Fluor Corporation, which has licensed the process under the Mathieson patents.

C. E. Hummel

SULFUR FROM PETROLEUM . . . 700,000 TONS PER YEAR BY MID-1952. *Petroleum Processing* **6**, 1248-1249 (1951) November.

This article reports data obtained in a recent survey of proposed plants and plants now op-

erating for the recovery of sulfur from hydrocarbon gases.

C. E. Hummel

Transmission Lines

Norris, H. L., Jr. STEAM TURBO-COMPRESSOR STATIONS. NOW FOR FIRST TIME STEAM-TURBINE DRIVEN CENTRIFUGAL COMPRESSORS ARE IN USE ON A GAS TRANSMISSION SYSTEM. PART I. *Petroleum Engr.* 23, D7-D10 (1951) November.

This is the first of a set of articles describing the use of centrifugal compressors driven by steam turbines at three compressor stations on the Transcontinental line. Increased fuel gas consumption is indicated with respect to regular gas-driven reciprocating units, but lower capital, maintenance and operating costs are expected.

J. D. Parent

Plummer, H. C. MANY PIPE LINES PROPOSED FOR CANADA. DECISION MAY BE REACHED BEFORE END OF YEAR ON WHICH LINES WILL BE GRANTED PERMITS. *Petrolum Engr.* 23, D28-D34 (1951) November.

Pipe lines proposed for Canada are listed and are shown graphically on a map.

J. D. Parent

Shiels, B. and Smith, C. W. CANADIAN PIPE LINE EXPANSION ASSURES RAPID GROWTH OF PRAIRIE PROVINCES' OIL INDUSTRY. *World Oil* 133, 223-234 (1951) December.

The Canadian and U.S. west coast offers entirely new markets for Alberta crude and natural gas, and a dozen firms are clamoring for the right to build the giant pipe lines necessary to supply the area. The contestants and the projects they intend to construct if the Alberta government gives them the green light to export oil and gas are discussed in this article.

Authors' Abstract

2000 MILES OF TGT LINES IN FINAL STAGES OF COMPLETION. *World Oil* 133, 252, 254, 257 (1951) November.

With the completion of a new 303 mile, 24 in. extension of the system across New York state, TGT now has a transmission system more than 2000 miles long, stretching from the Texas-Mexican border almost to the Canadian border. Total pipe line mileage in service is in excess of 5100 miles, with a total transmission capacity of 1,200,000,000 ft per day.

W. G. Bair

TRUNKLINE FEATURES MANY INNOVATIONS USED IN LAYING NATURAL GAS LINE. *Oil Gas J.* 50, 153-158 (1951) October 11.

The line and station design of Trunkline Gas Company's 1300 mile pipeline transmission system from McAllen, Texas, to Tuscola, Illinois, incorporates several innovations. Each section of line for approximately 25 miles out of each compressor station is wrapped with a 15 lb tar-impregnated asbestos felt to prevent sagging of the coal-tar base enamel. All valve settings were installed above ground. A reinforced concrete jacket 3 in. thick was placed over the river lines, which were buried a minimum of 15 ft below the river bottom. Compressor stations have "unitized design"; that is, the main compressor engines supply all of the power except lighting. All piping at the compressor stations is carried overhead.

J. J. Guyer

Underground Storage

Farrar, L. D. UNDERGROUND GAS STORAGE UP TO DATE. *Public Utilities Fort.* 48, 575-586 (1951) October 25.

The reasons for the large increase of underground storage of natural gas during the postwar years are briefly reviewed. Most of the article is devoted to the problems of The Peoples Gas Light and Coke Co. of Chicago in developing a suitable underground storage field. The Illinois Legislation has passed a bill which grants the right of eminent domain for storage projects where sub-surface formations are more than 500 feet below the surface of the soil.

O. T. Bloomer

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Coal Hydrogenation

Stockman, C. H. and Bray, J. L. THE HYDROGENATION OF COAL AT HIGH TEMPERATURES (REPORT NO. 3). Purdue University; Engineering Experiment Station Bulletin, Research Series No. 111.

This is the third in a series of reports on the hydrogenation of coal conducted under the sponsorship of the Indiana Gas Association. Indiana Bed No. 4 coal was hydrogenated without vehicle or catalyst under pressures up to 6000 psig and at temperatures in the range 1200 to 1450°F. Small amounts (15-60 g) of coal or coke were hydrogenated, mainly to methane, in a rocking batch autoclave. Gases were obtained with methane contents as high as 73.8% and net heating values as great as 736 Btu cu ft. Finely ground coal was more reactive than coarse material, although the difference was not great. The hydrogenation proceeded in two steps: first, the coal components making up the volatile matter were hydrogenated rapidly; second, the coke-like residue was hydrogenated at a relatively slow rate. As much as 80% of the coal was readily reacted, while under the best conditions, 96% has been reacted. Over 90% of the carbon reacted is converted to gaseous hydrocarbons, mainly methane.

C. H. Riesz

Fischer-Tropsch Synthesis

Arveson, M. H. (assigned to Standard Oil Co., Chicago) METHOD FOR PROCESSING CARBONACEOUS SOLIDS. U.S. 2,560,403 (1951) July 10.

This patent describes a fluid catalytic unit in detail, including (1) a process which utilizes the heat from the regenerated solids to sustain two or more reactions which take place in separate vessels at successively lower temperatures, and (2) a double-shell, combination reactor-regenerator fluid catalytic unit.

J. J. Guyer

Lanning, W. C. (assigned to Phillips Petroleum Co.) PREVENTION OF SOLID DEPOSITS IN FISCHER-TROPSCH PLANT LINES. U.S. 2,572,633 (1951) October 23.

The patent claims that, by adding a hydrocarbon fraction boiling between 100-500°F to the standard fluidized Fischer-Tropsch synthesis zone and catalyst regenerator, the solids, mainly wax, which normally accumulate downstream of the two zones and plug lines, are prevented and a more continuous catalytic process is obtained.

H. A. Dirksen

Industrial Wastes

Am. Petroleum Inst. MANUAL ON DISPOSAL OF REFINERY WASTES: VOL. III. CHEMICAL WASTES. (1951) Second Edition.

This second edition of volume III is 40 pages in length. The sources and properties of various types of waste waters from refinery operations are treated in separate chapters. The effects of pollution caused by these chemical wastes, and the methods and devices for their treatment and disposal similarly are subjects of chapters. Many references are given to the literature of chemical wastes. C. E. Hummel

Murdock, H. R. INDUSTRIAL WASTES. OZONE PROVIDES AN ECONOMICAL MEANS FOR OXIDIZING PHENOLIC COMPOUNDS IN COKE OVEN WASTES. *Ind.Eng. Chem.* 43, 125A-128A (1951) November.

The research program of the Ohio River Valley Water Sanitation Commission on the removal of phenol from the ammonia-still waste liquor of coke oven plants is discussed. The application of ozone to the destruction of phenol was studied on a laboratory and pilot-plant scale. Design data indicate that for an ozonator installed on a 100-oven coke plant, the total waste treatment cost would be about 3 cents/ton coal carbonized; for a 300-oven plant, 2 cents/ton. Treatment by chlorination would be 2 to 3 times higher. O. P. Brysch

Production

Reistle, C. E., Jr. TECHNOLOGY PLAYS HIGHLY IMPORTANT ROLE IN DEVELOPING OIL PRODUCTION. *Oil Gas J.* 50, 257-261 (1951) November 8.

The role of technology and research in meeting the challenge of finding more oil, producing it more economically, and improving its products is discussed. O. T. Bloomer

STRIPPER STUDY. *Oil Gas J.* **50**, 61-62 (1951) November 29.

A stripper well is defined as one which, producing at maximum unrestricted capacity, yields oil in such a volume that the profit therefrom is insufficient to warrant additional development in the field. Stripper wells account for 69% of all wells and 19% of the oil produced. Figures are given statewise for 1951.

J. D. Parent

Synthesis from CO-Steam

Kölbel, H. and Engelhardt, F. SYNTHESE VON KOHLENWASSERSTOFFEN UND SAUERSTOFF-HALTIGEN VERBINDUNGEN AUS KOHLENOXYD UND WASSERDAMPF. (SYNTHESIS OF HYDROCARBONS AND OXYGEN-CONTAINING COMPOUNDS FROM CARBON MONOXIDE AND STEAM). *Brennstoff-Chemie* (German) **32**, 150 (1951).

This brief note announces the reaction between carbon monoxide and steam as taking place in the presence of unspecified reactive catalysts at temperatures in the range 392 to 572°F. The reaction proceeds best at high pressure, but can also occur at approximately atmospheric pressure. Oxygen-containing compounds are best formed under high pressures. Producer gas, blast-furnace gas, or other carbon monoxide-containing gases can be used. Detailed results are to be presented in the near future.

C. H. Riesz

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Horner, V. V. APPRAISAL OF DRILLING MUD COSTS. p. 9

Ritch, H. B. NEW TECHNIQUES FOR APPLICATION OF PLASTICS IN CONSOLIDATING FORMATIONS. p. 9

7. ANALYTICAL METHODS AND TESTS

Aldehydes in Gases

Bailey, H. C. and Knox, J. H. DETERMINATION OF ALDEHYDES IN COMBUSTION PRODUCTS. *J. Chem. Soc.* (British) 2741-2742 (1951) October.

A method is described in which the aldehydes are oxidized by silver oxide to the silver salts of fatty acids. The silver is determined volumetrically by potassium thiocyanate. Separation and determination of individual aldehydes is achieved by chromatography of the acids which can be liberated from the silver salts. The method has been successfully applied to the identification and determination of the aldehydes formed during the oxidation of higher hydrocarbons.

Authors' Abstract

Coal Sampling Accuracy

Landry, B. A. and Anderson, W. W. COAL SAMPLING BY LARGE-INCREMENT WEIGHTS. *Trans. Am. Soc. Mech. Engs.* **73**, 989-996 (1951) October.

A sampling experiment is described that was aimed at determining the variance in percentage ash of large-weight single-increment samples of an Indiana coal. The observed variance is broken down into its component parts, which are calculated from the data obtained. Results show that for increments of large weight, such as are taken by mechanical samplers at large steam-generating stations, relatively few would be required for the coal studied to obtain a gross sample meeting present accuracy standards. The suggestion is made that studies on other coals should be made to confirm these findings which, if generally true, may lead to an upward revision of standards of accuracy in view of the practicability of taking larger numbers of increments mechanically.

Authors' Abstract

Gas Sampling

Richford, M. A. AN AUTOMATIC HIGH PRESSURE SAMPLE DEVICE FOR HEAT VALUE DETERMINATION. *Gas* **27**, 60 (1951) November.

A sample of gas, from a sampling point distant from a calorimeter, is collected over a seven-day period for heating value determination. Solenoid valves controlled by an electric timer act to admit equal volumes of gas to a sample cylinder at regular intervals. The water dis-

placed from this sample cylinder is collected in a storage cylinder for reuse.

C. E. Hummel

Gasoline Vaporization

Preston, S. T. A TOTAL VAPORIZATION METHOD FOR DETERMINATION OF EQUIVALENT VAPOR VOLUME OF PENTANES PLUS FRACTIONS. *Calif. Oil World* 44, 2-6 (1951) (First Issue) October.

A simple method for experimentally determining the equivalent vapor volume of pentane plus fractions from natural gasolines is described. A small liquid sample is pipetted through a mercury-sealed sintered-glass disc into an evacuated bulb and the pressure rise measured with a dibutyl phthalate manometer. The method is limited to those materials which will completely vaporize at 4 mm mercury pressure.

O. T. Bloomer

Infrared Gas Analysis

Devine, J. M. APPLICATION OF CONTINUOUS INFRARED ANALYZERS. *Instruments* 24, 1296-1299, 1340-1341 (1951) November.

A discussion of the non-dispersive type continuous infrared analyzers is presented. The principles of operation are explained and present commercial applications of this type of gas analyzer are listed.

D. V. Kniebes

Nitrogen in Shale Oil

Ball, J. S. and Van Meter, R. DETERMINATION OF NITROGEN IN SHALE OIL AND PETROLEUM. APPLICATION OF ESTABLISHED METHODS. *Anal. Chem.* 23, 1632-1634 (1951) November.

Seventeen cooperating laboratories carried out nitrogen analyses on identical samples by either Kjeldahl or Dumas methods and on macro, semimicro, or micro scales. The best value was selected from the largest group of Kjeldahl results. Acceptable limits were arbitrarily established, as within 2% of the best value, and the percentage of submitted results within acceptable limits varied from 41% for the macro-Kjeldahl method to 0% for the semimicro-Kjeldahl method.

I. Ladany

Lake, G. R., McCutchan, P., Van Meter, R. and Neel, J. C. (DETERMINATION OF NITROGEN IN SHALE OIL AND PETROLEUM). EFFECTS OF DIGESTION TEMPERATURE ON KJELDAHL ANALYSES. *Anal. Chem.* 23, 1634-1638 (1951) November.

Investigation of the variables in the Kjeldahl procedure revealed the importance of proper temperature in the digestion of the sample. Control of the amount of potassium sulfate in the digestion mixture leads to correct temperatures and therefore satisfactory analyses.

I. Ladany

Moore, R. T., McCutchan, D. A. and Young, D. A. (DETERMINATION OF NITROGEN IN SHALE OIL AND PETROLEUM). BASIC NITROGEN DETERMINED BY TITRATION WITH PERCHLORIC ACID. *Anal. Chem.* 23, 1639-1641 (1951) November.

A method is developed for distinguishing between basic and non-basic nitrogen by the titration of basic nitrogen against perchloric acid.

I. Ladany

Van Meter, R., Bailey, C. W., and Brodie, E. C. (DETERMINATION OF NITROGEN IN SHALE OIL AND PETROLEUM). EVALUATION OF DUMAS PROCEDURES BY MASS SPECTROMETRY. *Anal. Chem.* 23, 1638-1639 (1951) November.

The large scatter in values obtained by the Dumas procedure is traced to improper combustion technique.

I. Ladany

Sulfur Oxides Determination

Corbett, P. F. THE DETERMINATION OF SO_2 AND SO_3 IN FLUE GASES. *J. Inst. Fuel* (British) 24, 247-251 (1951) November.

The paper briefly reviews the underlying principles of an analytical method for the estimation of small traces of sulfur trioxide (SO_3) in the presence of a considerable excess of sulfur dioxide (SO_2), and describes the use of the method in the analysis of flue gases from a boiler and estimates the SO_2 and SO_3 concentrations in such a manner that the equilibrium existing between the oxides shall not be disturbed.

Author's Abstract

8. GENERAL AND PHYSICAL CHEMISTRY

Carbon Black Properties

Corrin, M. L. AREAS OF CARBON BLACKS AND OTHER SOLIDS BY GAS ABSORPTION. *J. Am. Chem. Soc.* 73, 4061-4065 (1951) September.

A comparison of the Brunauer-Emmett-Teller (BET) and Harkins-Jura (HJ) methods of surface area determination was made using a number of carbon blacks, rutile and rouge. Where the gas molecule's area is established experimentally with a solid of known area, the BET method appears to yield consistent results. The HJ method is less direct, requiring a knowledge of the associated constant, whose availability depends on the nature of the condensed film. With proper treatment, good agreement with the BET method is obtained.

S. Katz

Ladd, W. A. and Ladd, M. W. CARBON GEL AS REVEALED BY THE ELECTRON MICROSCOPE. *Ind. Eng. Chem.* 43, 2564-2568 (1951) November.

Examinations of polymer gels and carbon gels with an electron microscope resulted in the discovery of a structural difference between the polymer gel and polymer sol, and this was used in explaining photomicrographs of carbon gel structures. It is felt that this structure of the carbon gels gives the high modulus properties previously associated with highly loaded stocks, but without the additional troubles of shortness and cracking.

F. T. Perry

Flame Research

Dixon-Lewis, G. and Wilson, M. J. A METHOD FOR THE MEASUREMENT OF THE TEMPERATURE DISTRIBUTION IN THE INNER CONE OF A BUNSEN FLAME. *Trans. Faraday Soc.* (British) 47, 1106-1113 (1951) October.

The deflexions of the edges of a very narrow beam of light were recorded photographically at a number of distances 0.1 mm apart through the flame front of a 9.7% methane + air flame. From these deflexions, the temperature distribution in the flame front can be calculated very approximately. The time of passage of the gases through the temperature gradient was found to be about 10^{-3} sec, whilst the time of passage through the actual reaction zone is only of the order of 10^{-4} sec. The temperature at which reaction appears to commence is discussed.

Authors' Abstract

Pickering, H. S. and Linnett, J. W. BURNING VELOCITY DETERMINATIONS. PART VII. THE BURNING VELOCITIES OF SOME ETHYLENE + OXYGEN + NITROGEN MIXTURES. *Trans. Faraday Soc.* (British) 47, 1101-1106 (1951) October.

Burning velocities were determined for ethylene + oxygen + nitrogen mixtures by the soap bubble method. In the first part of the work ethylene-air mixtures were tested at reduced pressure. The results showed burning velocity to be unaffected by changes in pressure. This differs from the results previously obtained by Linnett and Wheatley, using the burner method. The second part of the work is an investigation of burning velocities of the ethylene-oxygen-nitrogen system for mixtures containing 9% ethylene and from 19.1 to 91.0% oxygen. The burning velocity is found to increase with increasing percent oxygen over the entire range investigated.

E. F. Searight

Zabetakis, M. G., Scott, G. S. and Jones, G. W. THE FLAMMABILITY CHARACTERISTICS OF THE C_nH_{2n-6} AROMATIC SERIES. U.S. Bureau of Mines Report of Investigations 4824 (1951) October.

The limits of flammability at 100°C and the ignition temperatures were experimentally determined for eight members of the C_nH_{2n-6} aromatic series. The compounds investigated were benzene, toluene, ethyl-benzene, *o*-xylene, *m*-xylene, *p*-xylene, cumene, and *p*-cymene. Tables of results and photographs of equipment used are included.

E. F. Searight

Fluid Flow

Bailey, J. E. METASTABLE FLOW OF SATURATED WATER. *Trans. Am. Soc. Mech. Engrs.* 73, 1109-1116 (1951) November.

This paper discusses the nature of the flow of saturated and nearly saturated water into re-

gions where the pressure is less than the saturation pressure. It presents a method of computing the mass rate of flow through orifices and nozzles which is based on the rate of evaporation from a metastable liquid core into a surrounding ring of vapor. The flow rates for orifices are predicted accurately, and rates for nozzles are predicted to within 10%. The analysis is based upon experimental investigations and is restricted to adiabatic flow conditions.

Author's Abstract

Leva, M., Weintraub, M., Grummer, M., Pollchik, M. and Storch, H. H. FLUID FLOW THROUGH PACKED AND FLUIDIZED SYSTEMS. U.S. Bureau Mines Bull. 504 (1951).

The fundamental research work done at the U.S. Bureau of Mines on fluidization and on flow of fluids through packed beds is presented in full, together with proposed correlations.

J. D. Parent

Hydrocarbon Spectra

Pickett, L. W., Muntz, M. and McPherson, E. M. VACUUM ULTRAVIOLET ABSORPTION SPECTRA OF CYCLIC COMPOUNDS. I. CYCLOHEXANE, CYCLOHEXENE, CYCLOPENTANE, CYCLOPENTENE, AND BENZENE. *J. Am. Chem. Soc.* 73, 4862-4865 (1951) October.

The vacuum ultraviolet absorption spectra have been measured for the ring hydrocarbons cyclohexane, cyclohexene, cyclopentane, cyclopentene, and benzene, and values of oscillator strength have been calculated. Possible correlations between the results and the molecular structure of the compounds are discussed.

J. M. Errington

Thermodynamic Properties

Benedict, M., Webb, G. B., Rubin, L. C. and Friend, L. EMPIRICAL EQUATION FOR THERMODYNAMIC PROPERTIES OF LIGHT HYDROCARBONS AND THEIR MIXTURES. REDUCTION OF EQUATION TO CHARTS FOR PREDICTION OF LIQUID-VAPOR EQUILIBRIA. *Chem. Eng. Progress* 47, 571-584 (1951) November.

Equations representing fugacities and liquid-vapor distribution coefficients in mixtures of light hydrocarbons developed in previous papers of this series are reduced to chart form to facilitate engineering application. This has been made possible by the discovery that the effect of composition on fugacities and distribution coefficients can be represented with sufficient accuracy by a single composition variable for each phase, its molal average boiling point. A set of 324 charts has been prepared for the 12 hydrocarbons methane, ethylene, ethane, propylene, propane, isobutane, isobutylene, n-butane, isopentane, n-pentane, n-hexane, n-heptane at 26 pressures between 14.7 and 3600 lb/sq in. abs. The charts cover a temperature range from −100° to +400° F and a range of molal average boiling points from −225° to +180° F. At pressures between 14.7 and 1000 lb/sq in. abs, the charts represent the dependence of the distribution coefficient, K, on temperature and the molal average boiling point of the vapor and liquid phases. At pressures between 1000 and 3600 lb/sq in. abs the charts represent the dependence of the fugacity: mole fraction ratio (here called fugacity coefficient) on temperature and molal average boiling point. In 12 mixtures of light hydrocarbons the average deviation of chart K's from those evaluated by the fugacity equations is only 3.2 per cent. This shows that the charts adequately represent the fugacity equations despite the drastic reduction in the number of variables used to represent the effect of composition. In 27 systems, comprising most of the reported experimental studies of liquid-vapor equilibria in light hydrocarbon mixtures, the average deviation of observed K's from those read from the charts is 7.1 per cent. This shows that the charts may be used for the prediction of dew points, bubble points and equilibrium flash separations with an accuracy sufficient for most engineering purposes. Examples of such calculations are given.

Authors' Abstract

Benson, S. W. and Golding, R. A. A REDUCED EQUATION OF STATE FOR GASES AND LIQUIDS. *J. Chem. Phys.* 19, 1413-1415 (1951) November.

An empirical, reduced equation of state is presented which holds with reasonable accuracy for both liquids and gases. Liquid densities of non-associated substances are predicted to within 4 percent, vapor pressures to within 25 per-

cent, heats of vaporization to within 10 percent and gas isotherms reproduced to within 10 per cent. The values predicted for the coefficients of thermal expansion and compressibility are not better than 30 percent. With the exception of the latter which are incapable of good representation by any such reduced equation, the equation represents a marked improvement over the van der Waals and Berthelot equations.

Authors' Abstract

Meissner, H. P. and Seferian, R. P-V-T RELATIONS OF GASES. *Chem. Eng. Progress* 47, 579-584 (1951) November.

Experimental compressibility factors of gases may deviate from those predicted by standard compressibility charts. The magnitudes of these deviations are shown to correlate with z_c, the compressibility factor at the critical point for the gas in question. These deviations can be substantial for a gas whose value of z_c differs from 0.27. A graphical analysis of these deviations is presented, whereby the compressibility factors read from a standard compressibility chart can be corrected. Authors' Abstract

Othmer, D. F. and Gilmont, R. CORRELATING PHYSICAL AND THERMODYNAMIC PROPERTIES. PART I. *Petroleum Refiner* 30, 111-118 (1951) November.

The methods described in this article for the correlation of physical chemistry data used in petroleum technology depend on the comparison of the properties of one of the substances with those of another substance under the same conditions, both by algebraic methods based on sound thermodynamic equations and geometric plotting. For example, straight-line plots are obtained when vapor pressures of representative hydrocarbons are plotted against vapor pressure of hexane at the same temperatures. The slope of the lines represents the ratio of latent heats of the pure substance and the reference substance. These plots are made to determine the vapor pressures of binary mixtures and also for the cases of gas solubilities, gas adsorption, and equilibrium constants. Straight lines are obtained when K values of hydrocarbons are plotted against vapor pressure of reference substances at the same temperatures. Similar plots based on reduced properties could be made when extreme precision in the critical range is desired.

D. C. Gami

Vapor Pressures

Hopke, E. R., and Sears, G. W. VAPOR PRESSURES BELOW 1 MM HG OF SEVERAL AROMATIC COMPOUNDS. *J. Chem. Phys.* 19, 1345-1351 (1951) November.

Vapor pressures of the three isomeric picolines and *p*-di-tert-butylbenzene were determined over a pressure region of approximately 5-250 microns Hg using a Rodebush manometer and an effusion manometer for each compound. The experimental results of the two methods show good agreement. A comparison of the two manometers is made and the merits of each method are discussed.

Authors' Abstract

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Devine, J. M. APPLICATION OF CONTINUOUS INFRARED ANALYZERS. p. 13

Parmelee, G. V. RADIANT ENERGY EMISSION OF ATMOSPHERE AND GROUND. p. 18

9. ORGANIC CHEMISTRY

Aromatics Production

Kassel, L. S. (assigned to Universal Oil Products Co., Chicago) THREE-STAGE CATALYTIC PROCESS FOR REFORMING GASOLINE. U.S. 2,573,149 (1951) October 30.

The patent claims a process for reforming saturated hydrocarbons boiling in the gasoline range which comprises passing the hydrocarbons and hydrogen through three chambers, all utilizing a platinum-containing catalyst, and operated at 750-1000° F. The first chamber, under adiabatic conditions removes poisonous carbon-forming compounds; the second, with radiant heating under endothermic conditions, aromatizes the hydrocarbons; and the third, under adiabatic conditions, hydrocracks the hydrocarbon to give a large yield of high-octane gasoline with high catalyst life.

H. A. Dirksen

PHENOL—NOT BETTER SOON. *Chem. Week* 69, 59 (1951) November 24.

The outlook of phenol production is reviewed. It is stated that not until late in 1952 will there be an ample supply.

W. J. Pleticka

Organic Sulfur Reaction

Wadley, E. F. (assigned to Standard Oil Development Co.) PRODUCTION OF THIOPHENE FROM DIOLEFIN AND HYDROGEN SULFIDE. U.S. 2,570,083 (1951) October 2.

Thiophene is produced by reacting hydrogen sulfide with a conjugated diolefin such as butadiene in a silica chamber without a catalyst. Temperatures of 500-650°C and pressures from atmospheric to 150 psi are used. Higher yields of thiophene and benzene, and decreased formation of byproducts are improvements over the prior art in which iron pyrites are used as the catalyst.

C. E. Hummel

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Knops, J. J. MANUFACTURE OF PYROMELLITIC ACID. p. 4

Miller, R. J. PRODUCTION OF POLYCARBOXYLIC ACID PRODUCTS. p. 4

10. CHEMICAL ENGINEERING

Atomizers

Adler, C. R. and Marschall, W. R., Jr. PERFORMANCE OF SPINNING DISK ATOMIZERS. PART I. *Chem. Eng. Progress* 47, 515-522 (1951) October.

A discussion of the theory of spinning disk atomizers is presented. The experimental technique and equipment is explained in detail. The authors also give the procedures used for calculating weight and drop size distribution data. Very difficult sampling and operating procedures are involved.

W. G. Bair

Cooling Towers

Degler, H. E. SELECTION AND OPERATION OF WATER-COOLING TOWERS AND AIR-COOLED HEAT EXCHANGERS. *World Oil* 133, 228-234 (1951) December.

Selection and operation of cooling water towers are discussed. Some cost data for cooling by water and by air are given. [See also *Gas Abs.* 7, 260 (1951) November].

J. D. Parent

Fluidized Heater

Norton, C. L., Jr. (assigned to The Babcock & Wilcox Co.) FLUID HEATING. U.S. 2,571-749 (1951) October 16.

The patent describes a fluid heat transfer unit with two chambers, one on top of the other. The fluid material flows down through the two chambers by gravity and is returned to the top by a bucket lift or similar means. Fuel gases or liquids are burned in the upper chamber, with excess air supplied through the lower chamber. The air is preheated by passage upward through the descending fluid mass, resulting in high combustion temperatures. A manifold for drawing off these high-temperature combustion products for further heating loads is a feature of the system. Combustion temperatures of 3500-4000°F are claimed. Ultimate temperature is limited only by the refractory materials available.

W. G. Bair

Gas Adsorption

Berg, C. H. (assigned to Union Oil Company of California) ADSORPTION PROCESS. U.S. 2,571,329 (1951) October 16.

This patent claims an improved process and apparatus for the separation of unsaturated hydrocarbons or thermally sensitive gaseous mixtures through selective adsorption on granular charcoal. The process is particularly suited to the separation of gaseous mixtures produced by cracking operations. It is possible to effect the separation using moderate temperatures and pressures because of preliminary distillation steps.

C. A. M. Hall

Heat Radiation

Parmelee, G. V. and Aubele, W. W. RADIANT ENERGY EMISSION OF ATMOSPHERE AND GROUND: A DESIGN FACTOR IN HEAT GAIN AND HEAT LOSS. *Heating, Piping & Air Conditioning* 23, 120-129 (1951) November.

This article is a discussion of the nature, magnitude, and significance of the low-temperature long-wavelength radiation received by building surfaces. A radiometer which is used is briefly described. Examples show that on a cloudless night a well-insulated flat roof loses 35% more heat than when the sky is overcast, 25% more than when it is windy and overcast, 15% more than when it is windy and clear. The effect on vertical surfaces is smaller. It is shown that the heat flow through a sunlit roof calculated without regard to radiant energy exchange will be about 40% too high for a 24-hour period.

B. G. Lang

Pebble Heater

Weber, L. J. (assigned to Phillips Petroleum Co.) PEBBLE HEATER APPARATUS. U.S. 2,573,747 (1951) November 6.

Improvements in the design of pebble heating apparatus are given, consisting primarily of a built-in combustion chamber and improved distribution of heating gases through a grill work of refractory brick.

C. von Fredersdorff

Pipeline for Chemicals

CHEMICAL FREIGHT PIPED. *Chem. Week* 69, 13-20 (1951) November 3.

Transport of chemicals and chemical raw-materials through pipes is on the increase. Some are riding "piggyback" on the natural gas in pipelines from Texas to the Northeast. The most significant facility of this type is to use natural gas to carry ethane from Texas to petro-chemical plants in the Middle West. Significant quantities of raw materials (as brine and propane) and items of manufacture (acetone, chlorine and styrene) are being carried in the usual manner, particularly in Texas, by pumping them through pipes.

C. A. M. Hall

Steam-Ejector Performance

Holton, W. C. EFFECT OF MOLECULAR WEIGHT OF ENTRAINED FLUID ON THE PERFORMANCE OF STEAM-JET EJECTORS. *Trans. Am. Soc. Mech. Engrs.* 73, 905-910 (1951) October.

Tests were conducted using two small commercial single and two-stage steam-ejectors in pumping 13 pure gases and 12 mixtures of gases. The tests were conducted at a nominal temperature of 80°F and pressures from shutoff to 20 in. Hg abs on single-stage ejectors, and shutoff to 10 in. Hg abs on two-stage ejectors. The results were calculated in terms of "entrainment ratio," which is the ratio of the flow rate of the gas to that of air under similar conditions. The entrainment ratio is shown to be a function of the molecular weight of the gases, and is plotted as a smooth curve independent of pressure or design characteristics of the ejectors. A graph giving entrainment ratio as a function of molecular weight is included for molecular weights up to 150.

E. J. Pyrcioch

Holton, W. C. and Schultz, E. J. EFFECT OF TEMPERATURE OF ENTRAINED FLUID ON THE PERFORMANCE OF STEAM-JET EJECTORS. *Trans. Am. Soc. Mech. Engrs.* 73, 911-913 (1951) October.

The performance of small commercial single and two-stage steam-jet ejectors handling air and steam was investigated. The test results are expressed in terms of "entrainment ratio," which is the ratio of the flow rate of gas at the test temperature to that at the base temperature of 90°F. The maximum temperature reached in the tests was 1000°F. The entrainment ratio was found to be a linear function of temperature and independent of pressure (in the range of 0.2 to 10.0 in. Hg abs) or the design characteristics of the ejector. Graphs giving entrainment ratio as a function of temperature for air and steam are included.

E. J. Pyrcioch

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Leva, M. FLUID FLOW THROUGH PACKED AND FLUIDIZED SYSTEMS. p. 15

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Analog Calculating Devices

Morris, W. L. ANALOGICAL COMPUTING DEVICES IN THE PETROLEUM INDUSTRY. *Ind. Eng. Chem.* **43**, 2478-2483 (1951) November.

Three analog computing devices which are presently in use in the petroleum industry are described. One employed in the calculation of hydrocarbon analysis by infrared absorption is designed to solve simultaneous linear algebraic equations. The second unit described is used in the computation of vapor-liquid equilibrium. The third unit is used in the study of oil reservoir behavior.

B. E. Hunt

Wolf, A. and Lee, B. D. (assigned to The Texas Co., New York) ELECTRICAL ANALOGUE. U.S. 2, 569,817 (1951) October 2.

This patent describes an invention based upon the analogy that the flow of electric current in a properly constructed electrically conductive model will be similar to the flow of gas and/or oil in a producing structure.

B. E. Hunt

INSTITUTE OF GAS TECHNOLOGY CALCULATOR PROVIDES DISTRIBUTION SYSTEMS ANALYSES. *Gas Age* **108**, 17-18, 66 (1951) November 22; *Gas* **27**, 42-43 (1951) December; *Can. Gas J.* **44**, 321-323 (1951) November; *Heating, Piping and Air Conditioning* **23**, 86, 87 (1951) December; *Gas J.* (British) **268**, 539 ((1951) November 28.

The Institute of Gas Technology has provided the gas industry with a calculator suitable for the study of distribution design problems. The calculator is particularly useful in determining flow patterns and pressure data on complicated grid systems. A description of the calculator is given. The operating procedure is discussed and illustrated with an example problem.

B. E. Hunt

MECHANICAL BRAIN CALCULATES GAS ENGINEERING PROBLEMS. *Gas News* **14**, 4 (1951) December.

A brief description is given of the application of an electric analog calculator to the calculation of gas distribution system problems. The calculator is especially useful in determining pressure drops and flow patterns in grid systems.

B. E. Hunt

Gas Calorimeter

Schuller, P. (assigned to Societe Anonyme de Commentry-Fourchambault & Decazeville, France) APPARATUS FOR DETECTING THE CALORIC OUTPUTS OF GASEOUS FUELS. U.S. 2,574,665 (1951) November 13.

A gas calorimeter of constant water-flow type is described, in which the gas flow varies with the pressure difference between opposite sides of an orifice in the gas main, and the calorific output is directly proportional to the temperature difference between the inlet and outlet water.

O. P. Brysch

Pyrometers

Lalos, G. T. A SONIC-FLOW PYROMETER FOR MEASURING GAS TEMPERATURES. *J. Research Natl. Bur. Standards* **47**, 179-190 (1951) September.

A sonic pyrometer is described, in which the thermocouple element is located in the axis of a critical flow nozzle near the plane of sonic flow. The instrument is easily shielded from radiation loss. It measures free stream total temperature, regardless of gas velocity. It is accurate from about 3°F up to 1500°F. The article discusses the theory of the instrument and gives elaborate details of the design and recommended construction.

S. Katz

Male, D. W. A PHOTOGRAPHIC PYROMETER. *Rev. Sci. Instruments* **22**, 769-772 (1951) October.

A photographic pyrometer is described that indicates apparent surface temperatures by photographing hot surfaces and correlating the variable density of the photographic negative with the apparent surface temperature. The need for critically controlled photographic and

development technique is eliminated by incorporating into every photograph the images of standard targets whose apparent surface temperatures are independently determined with an optical pyrometer. The apparent temperatures of all areas of the photographed region can be determined simultaneously and instantaneously.

Author's Abstract

12. MATERIALS OF CONSTRUCTION

Alloys

Morton, B. B. SELECTING ALLOYS TO RESIST CORROSION. *Petroleum Processing* **6**, 1233-1235 (1951) November.

Corrosion in petroleum refineries may be arrested by proper selection of alloys. The selection depends on the operating temperature of the equipment and the various layers of corrosive chemicals. These factors are presented in this article. In general, the chrome-nickel type of stainless steel is used for operation above 500°F while Monel, Inconel, and 70 copper-30 nickel are used for lower temperature operations.

S. Mori

Cathodic Protection

Rohrman, F. A. A BIBLIOGRAPHY ON CATHODIC PROTECTION. *World Oil* **133**, 286 (1951) November.

As a follow up of the "Bibliography on Cathodic Protection" previously published in the July, 1950, issue of *World Oil*, the literature for the year 1950 is reported. The references list the author, title, journal, volume, page and year, plus a classification as to their main import on subject matter.

B. E. Hunt

Corrosion

Evans, U. R. DRY OXIDATION AND WET CORROSION. *Nature* (British) **168**, 853-855 (1951) November 17.

The two main theories pertaining to metallic corrosion, namely the "film theory" and the "electrochemical theory" are shown to express the same ideas from two different viewpoints. The action of inhibitors and impurities can be explained in a similar fashion.

B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. PART 34. THE COPPER SULFATE ELECTRODE. *Oil Gas J.* **50**, 79 (1951) November 1.

The problems involved in cathodic protection of well casings, as compared to pipelines, are discussed.

B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. PART 35. THE COPPER SULFATE ELECTRODE. *Oil Gas J.* **50**, 331 (1951) November 8.

The copper-copper sulfate half-cell used for potential measurements is described. Three common types of half-cell assemblies are illustrated and discussed.

B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. PART 36. CORROSION TESTING FOR REFINERY COMPONENTS. *Oil Gas J.* **50**, 161 (1951) November 15.

Four methods are described for obtaining information as to the corrosion severity at a location prior to designing protective measures.

B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. PART 37. CORROSION RATES BY DIRECT OBSERVATION. *Oil Gas J.* **50**, 111 (1951) November 29.

Inspection of equipment for corrosion loses much of its value for future use unless careful records are kept. A definite nomenclature describing the corrosion, or better still, photographs, plaster casts or depth measurements of pitting should be kept.

B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. PART 38. CORROSION TEST SPECIMENS. *Oil Gas J.* **50**, 111 (1951) December 6.

The precautions and fundamental principles of using test coupons for measuring the corrosivity of a particular environment are discussed.

B. E. Hunt

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